CLAIMS

1. A semiconductor-type three-axis acceleration sensor comprising:

a weight positioned in a center of the semiconductor-type three-axis acceleration sensor and being applied to by outside acceleration;

a support frame for supporting the weight;

at least one flexible arm, shaped in a thin beam, connecting an upper surface of the weight and an upper surface of the support frame at two first connection ends at both ends of the flexible arm between the weight and the support frame;

a plurality of piezo resistors, for measuring each axis-component of three axis-components of the acceleration, disposed on an upper surface of the flexible arm and aligned along the upper surface of the flexible arm in a longitudinal direction of the flexible arm; and

lead wires connecting terminals of the plurality of piezo resistors on the upper surface of the flexible arm,

wherein the flexible arm is composed of: a flexible parallel part having a second connection end at each of both ends of the flexible parallel part and a substantially uniform width; and two flexible widening parts that connect between one of the second connection ends of the flexible parallel part and the first connection end with the support frame/the weight and are widening from the second connection ends of the flexible parallel part toward the first connection ends;

each of the plurality of piezo resistors disposed on the upper surface of the flexible arm is positioned apart from the first connection end of the flexible arm; and

each of the plurality of piezo resistors for measuring at least one axis-component of the three axis-components of the acceleration extends from the flexible widening part, across the second connection end and on the flexible parallel part.

2. A semiconductor-type three-axis acceleration sensor as set forth in claim 1, wherein the flexible arm has a maximum stress part of the flexible arm on the flexible widening part, and

each of the plurality of piezo resistors for measuring at least one axis-

component of the three axis-components of the acceleration has a terminal of the piezo resistor at the maximum stress part on the flexible widening part and extends from the maximum stress part, across the second connection end and on the flexible parallel part.

3. A semiconductor-type three-axis acceleration sensor as set forth in claim 2, wherein the flexible widening part has curved or straight ridges on both side ends of its upper surface, which are symmetric to each other with respect to a width centerline of the flexible arm.

4. A semiconductor-type three-axis acceleration sensor as set forth in claim 2, wherein the ratio W2/W1 of a width W2 of the flexible parallel part to a width W1 of the flexible arm at the first connection end of the flexible widening part is at least 0.2 and at most 0.6.

5. A semiconductor-type three-axis acceleration sensor as set forth in claim 2, wherein the ratio L2/L1 of a length L2 of the flexible parallel part to a total length L0 of the flexible arm is at least 0.4 and at most 0.9.

6. A semiconductor-type three-axis acceleration sensor as set forth in claim 2, wherein each of the plurality of piezo resistors for measuring at least one axis-component of the three axis-components of the acceleration has both terminals shifted in position in the longitudinal direction of the flexible arm from the maximum stress part on the flexible widening part.

7. A semiconductor-type three-axis acceleration sensor as set forth in claim 2, wherein each of the plurality of piezo resistors for measuring at least one axis-component of the three axis-components of the acceleration is shifted in position from a width centerline of the flexible arm to a side end of the flexible arm on the upper surface of the flexible arm.

8. A semiconductor-type three-axis acceleration sensor as set forth in claim 7, wherein each of the plurality of piezo resistors for measuring an axis-component vertical to the upper surface of the weight among the three axis-components of the acceleration is positioned on the width centerline of the flexible arm on the upper surface of the flexible arm.

9. A semiconductor-type three-axis acceleration sensor as set forth in claim 8, wherein each of the plurality of piezo resistors for measuring at least one axis-component of the three axis-components of the acceleration has both terminals apart in the longitudinal direction of the flexible arm from the maximum stress part on the flexible widening part.

10. A semiconductor-type three-axis acceleration sensor as set forth in claim 7, wherein each of the plurality of piezo resistors shifted in position from the width centerline of the flexible arm to the side end of the flexible arm on the upper surface of the flexible arm has another piezo resistor symmetrically positioned with respect to the width centerline on the upper surface of the flexible arm.

11. A semiconductor-type three-axis acceleration sensor as set forth in claim 10, wherein each of the plurality of piezo resistors for measuring an axis-component vertical to the upper surface of the weight among the three axis-components of the acceleration is positioned on the width centerline of the flexible arm on the upper surface of the flexible arm.

12. A semiconductor-type three-axis acceleration sensor as set forth in claim 10, wherein each of the plurality of piezo resistors shifted in position from the width centerline of the flexible arm to the side end of the flexible arm on the upper surface of the flexible arm and the other piezo resistor symmetrically positioned to each of the plurality of shifted piezo resistors with respect to the width centerline on the upper surface of the flexible arm are connected in series by a lead wire.

13. A semiconductor-type three-axis acceleration sensor as set forth in claim 12, wherein each of the plurality of piezo resistors shifted in position from the width centerline of the flexible arm to the side end of the flexible arm on the upper surface of the flexible arm and the other piezo resistor symmetrically positioned to each of the plurality of shifted piezo resistors with respect to the width centerline on the upper surface of the flexible arm are connected in series by a high-concentration diffusion layer between their terminals positioned on a length centerline side of the flexible arm.

14. A semiconductor-type three-axis acceleration sensor as set forth in claim 12, wherein each of the plurality of piezo resistors for measuring an axis-component vertical to the upper surface of the weight among the three axis-components of the acceleration is positioned closer to the width centerline of the flexible arm than a plurality of piezo resistors for measuring another axis-component of the three axis-components of the acceleration.

15. A semiconductor-type three-axis acceleration sensor as set forth in claim 10, wherein each of the plurality of piezo resistors for measuring at least one axis-component of the three axis-components of the acceleration has both terminals shifted in position in the longitudinal direction of the flexible arm from the maximum stress part on the flexible widening part.

16. A semiconductor-type three-axis acceleration sensor as set forth in claim 10, wherein the other piezo resistor is a dummy element connected by a dummy lead wire.